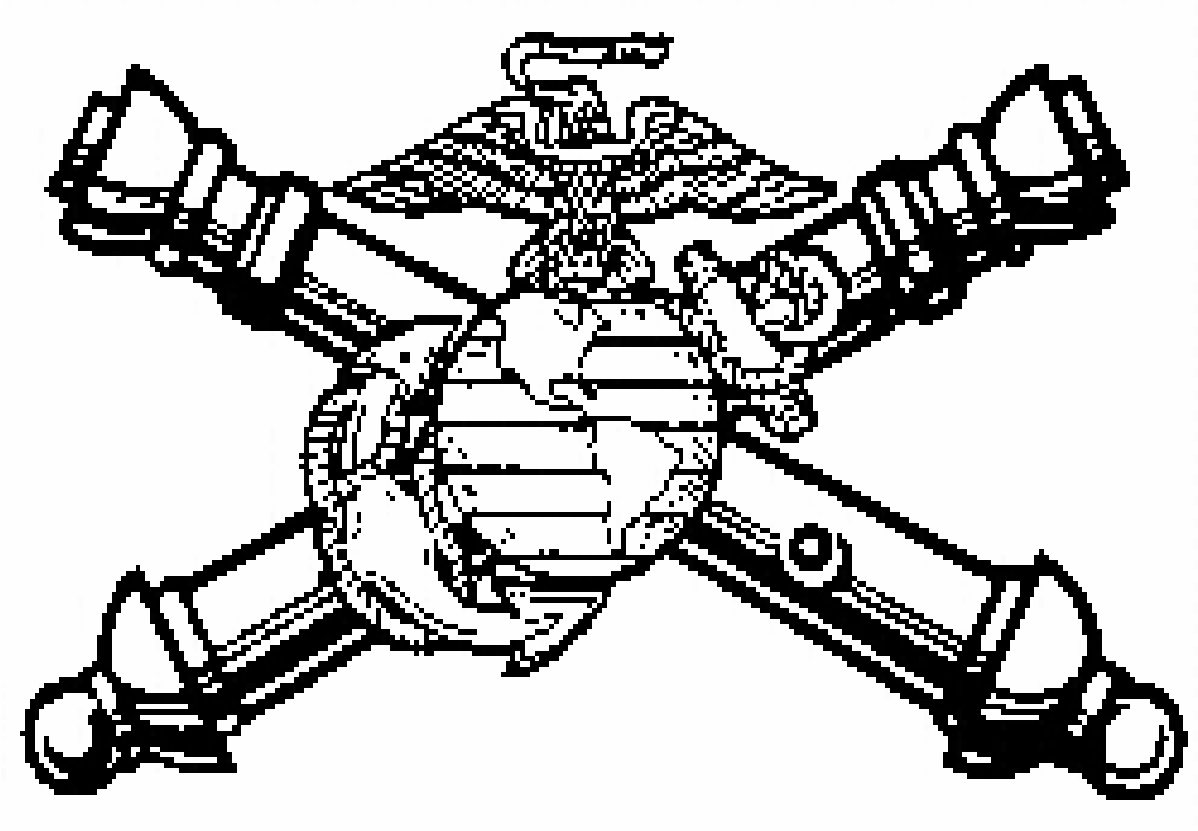
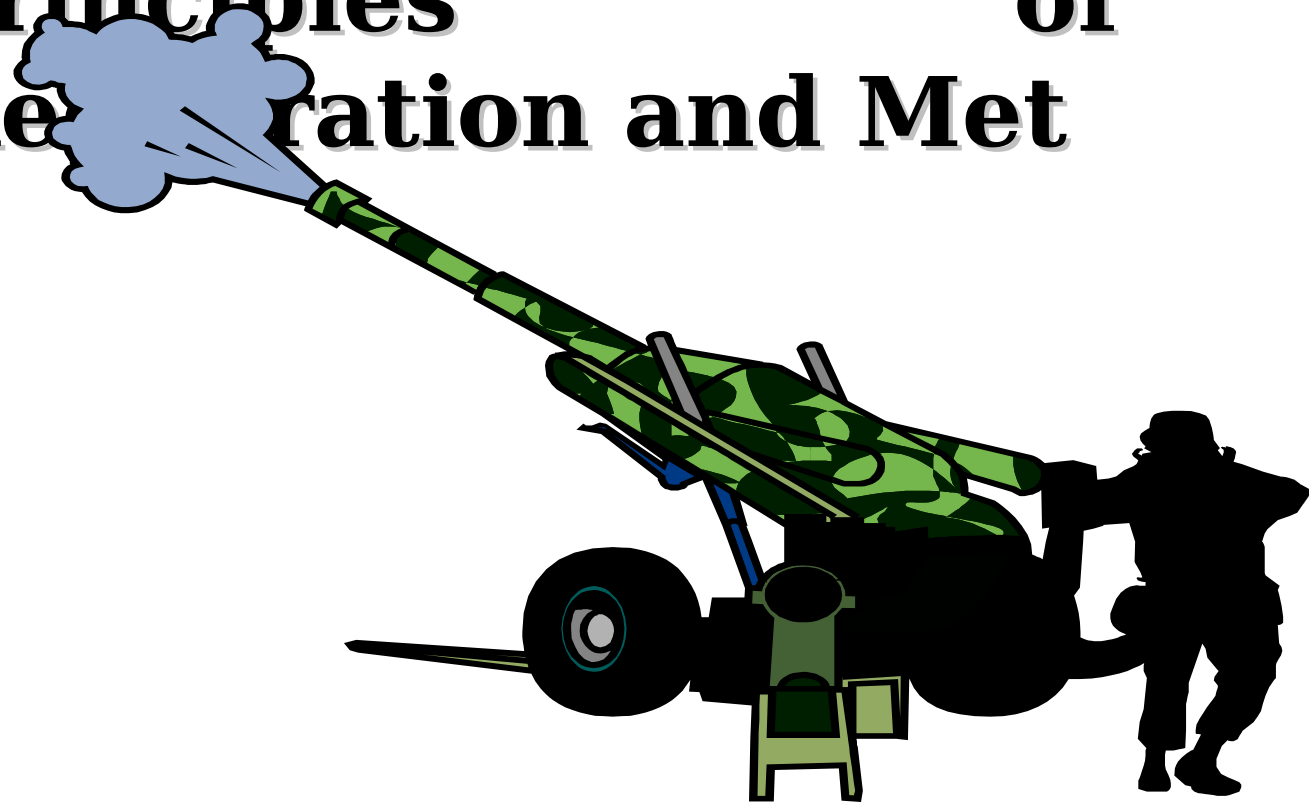
MARINE CORPS FIELD ARTILLERY
FIRE CONTROLMAN COURSE



PRINCIPLES OF REGISTRATION AND MET

Objective: To discuss the principles of Registration and Met

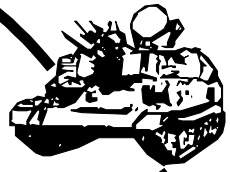


WHAT DO I NEED TO KNOW ?

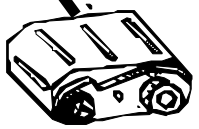
- ★ HOW TO IMPROVE OUR FIRING DATA WHEN STANDARD CONDITIONS DO NOT EXIST.
- STRIVE AS ARTILLERY MEN TO ACHIEVE 1ST ROUND FFE.
- DETERMINE THE VALIDITY OF A COMPUTER MET MESSAGE.

FIVE REQUIREMENTS FOR ACCURATE PREDICTED FIRE

4. ACCURATE MET INFO



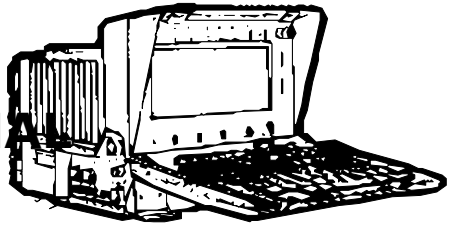
1. ACCURATE TARGET LOCATION



2. ACCURATE BATTERY LOCATION

3. ACCURATE WPN & AMMO INFO

5. ACCURATE COMPUTATIONAL PROCEDURES



ACCURATE TGT LOCATION AND SIZE (STEP #1)

- ***Accurate TGT location allows FDC to accurately determine range and deflection.***

  - Observer w/ laser sending polar msn is most accurate method.

  -BN Survey Team

Accurate Battery Location (STEP # 2)

- **Is the other factor that allows the determination of accurate range and deflection to the TGT.**
- **Equally important is accurate directional control for the lay of the weapons.**

Survey

- OS provides 10 digit grid/alt

- EOL provides direction to .1 mil

ACCURATE WEAPON AND AMMUNITION INFORMATION (STEP# 3)

- **Allows for the compensation for individual variations caused by the combination of specific weapons and lots of ammunition.**

  - recorded/used in FDC. (mv, prop temp, proj wt)

- **Determined by using the M94 chronograph and muzzle velocity correction tables (MVCT) M90-2 for each charge, propellant type and projectile family.**

ACCURATE METEOROLOGICAL INFORMATION (STEP #4)

- **Effects of weather on the projectile in flight must be considered, and compensated for.**

  -FT and technical gunnery procedures allow a unit to take into account for air temp, air density, wind direction and wind speed.

ACCURATE COMPUTATIONAL PROCEDURES (STEP #5)

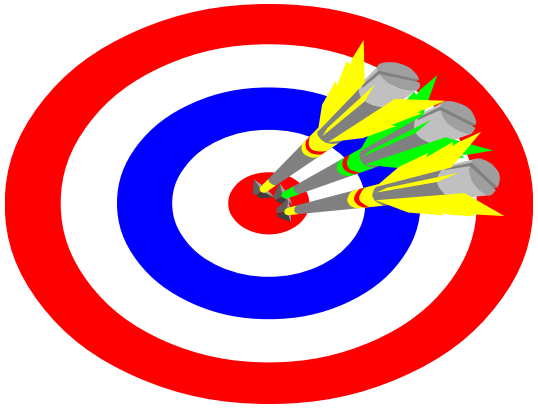
- **The computation of firing data must be accurate.**
- **Manual and automated methods of determining data must be perfected and maintained.**

  - Procedures must be able to balance the need for accuracy against speed.

ON THE 5 REQUIREMENTS FOR
ACCURATE PREDICTED FIRE

QUESTIONS ?

IF STANDARD CONDITIONS CANNOT BE MET, THE UNIT WILL NOT BE ABLE TO FIRE ACCURATELY.



REGISTRATIONS

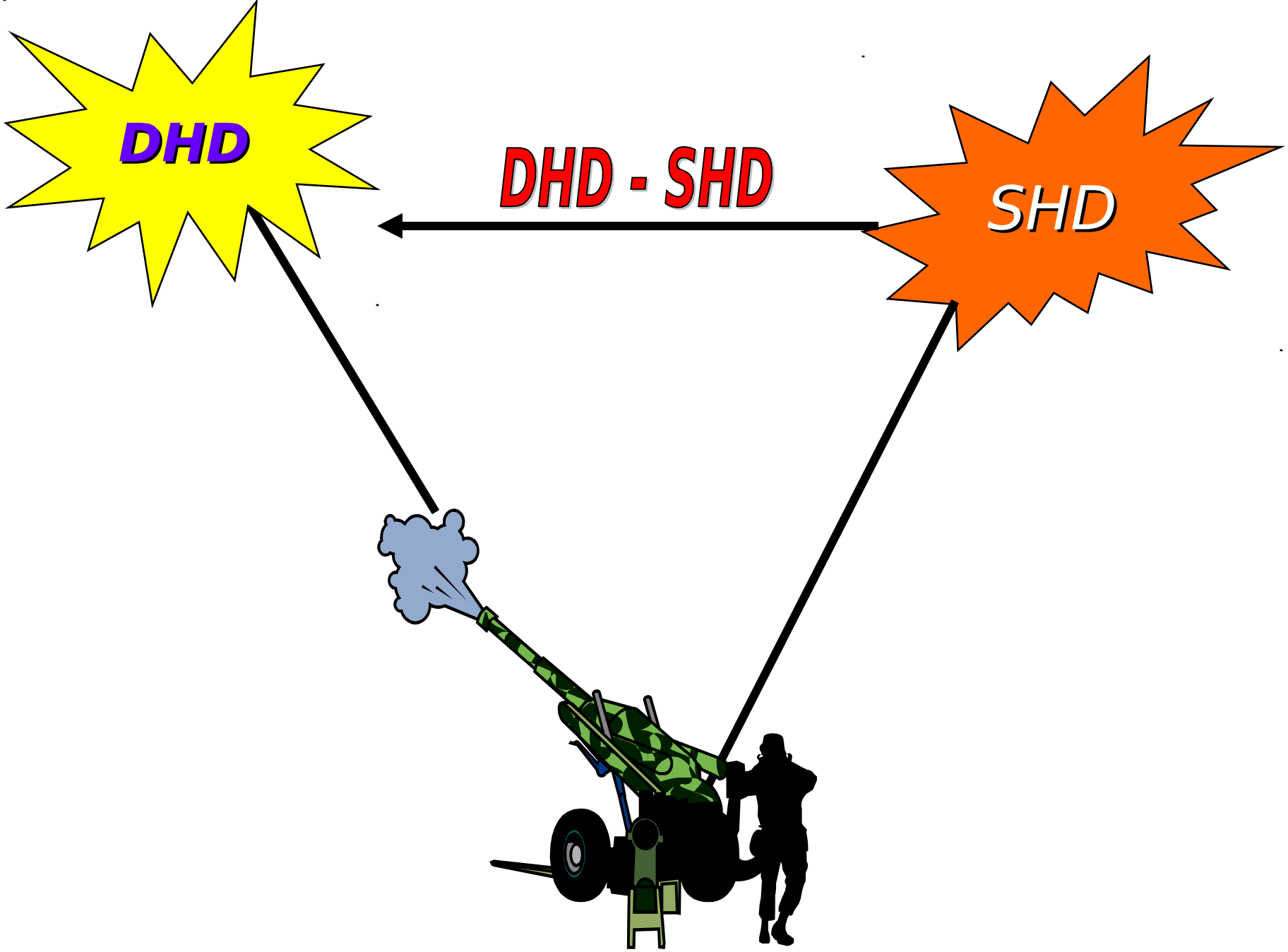
PURPOSE: To determine firing data corrections that will solve for the cumulative effects of all non-standard conditions.

" TOTAL CORRECTIONS "

WHAT ARE TOTAL CORRECTIONS ?

WE DETERMINE TOTAL CORRECTIONS BY COMPARING THE *SHOULD HIT DATA* (UNDER STANDARD CONDITIONS)

TO THE *DID HIT DATA* (DATA REQUIRED TO ENGAGE THE TGT DUE TO NONSTANDARD CONDITIONS)


DHD
DHD - SHD
SHD

TWO TYPES OF REGISTRATIONS

Precision Registration

Requires an observer to adjust a group of rounds fired from the same howitzer so that their mean point of impact occurs at a point of known location (KNOWN POINT)

High Burst/Mean Point of Impact Registration

The unit fires a number of rounds "6" with the same set of data. Rounds are observed by two observers who measure the location of each bursting round. Based on observers measurements FDC can determine the mean burst location.

Alternate Registration Methods

Purpose: May be used by unit in a particular tactical situation:

1. Radar Observed Registration: **"FIRE FINDER RADAR"**
2. Abbreviated Registration: **"USING FEWER USABLE ROUNDS" RECOMMENDED FOR PREC REG OR HB/MPI TECHNIQUES.**
3. Offset Registration: **"1000 TO 2000m AWAY FROM FIRING UNIT CENTER, IF COMMON SURVEY EXISTS BETWEEN THE TWO POSITIONS."**

"QUESTIONS"

FIVE STEPS TO IMPROVE FIRING DATA

1. ***ROUND BURSTS AT A POINT OF KNOWN LOCATION.***
2. ***DETERMINE SHOULD HIT AND DID HIT DATA.***
3. ***DETERMINE TOTAL CORRECTIONS.***
4. ***ISOLATE POSITION CONSTANTS.***
5. ***DETERMINE NEW TOTAL CORRECTIONS.***

STEP 1 : ROUND BURSTS AT A POINT OF KNOWN LOCATION

- ***ONE OF THE TWO TYPES OF REGISTRATIONS HAS BEEN FIRED.***

STEP 2: DETERMINE SHOULD HIT AND DID HIT DATA.

- ***SHOULD HIT DATA IS DATA THAT WHEN FIRED UNDER STANDARD CONDITIONS SHOULD CAUSE THE ROUND TO BURST AT THE TARGET.***

- ***DID HIT DATA IS DATA THAT WHEN FIRED UNDER NONSTANDARD CONDITIONS DID CAUSE THE ROUND TO BURST AT THE TARGET.***

TYPES OF ERRORS

HUMAN ERRORS: ***HUMAN MISTAKES***

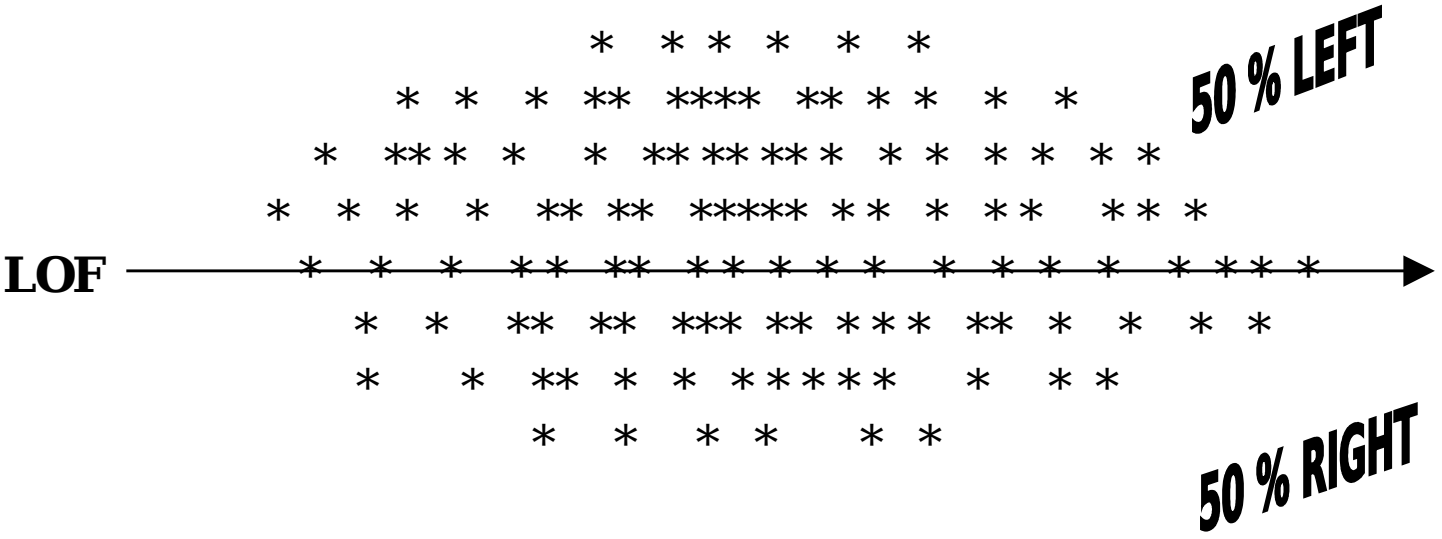
CONSTANT ERRORS: ***CONSTANT NONSTANDARD FACTORS***

INHERENT ERRORS: ***ARE BEYOND OUR CONTROL AND IMPRACTICAL TO MEASURE.***

" ARE NOT CORRECTABLE"

" DISPERSION "

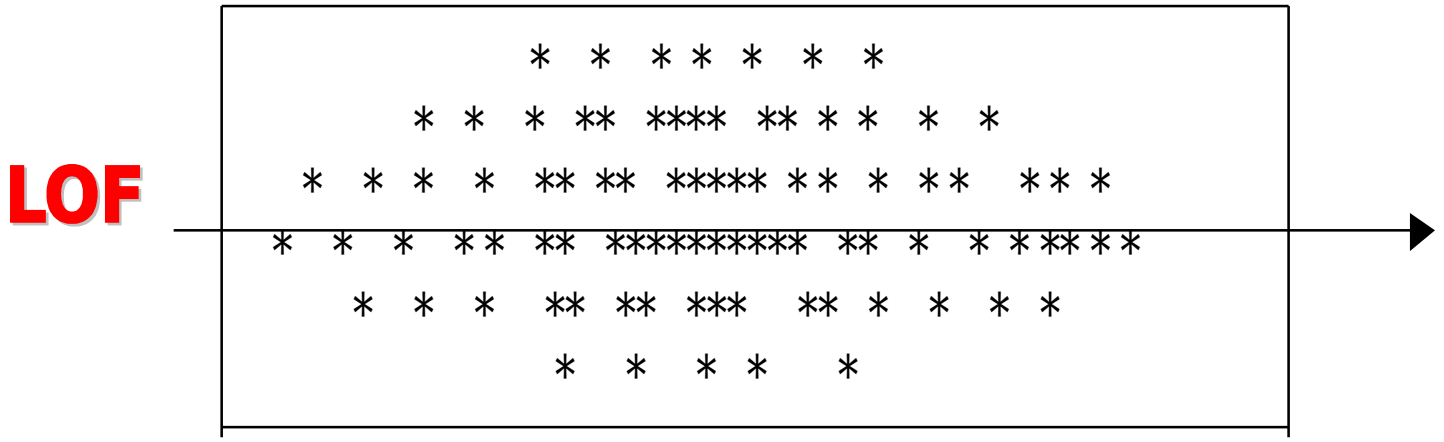
When a number of rounds are fired from the same gun with the same data, the rounds will not all impact on a single point, but will fall in a scattered pattern



100% RECTANGLE

IF WE PLACE A RECTANGLE AROUND THE OUTER EDGES OF THE DISPERSION PATTERN, WE HAVE A 100% RECTANGLE

(CONTAINING 100% OF THE USABLE IMPACTS)

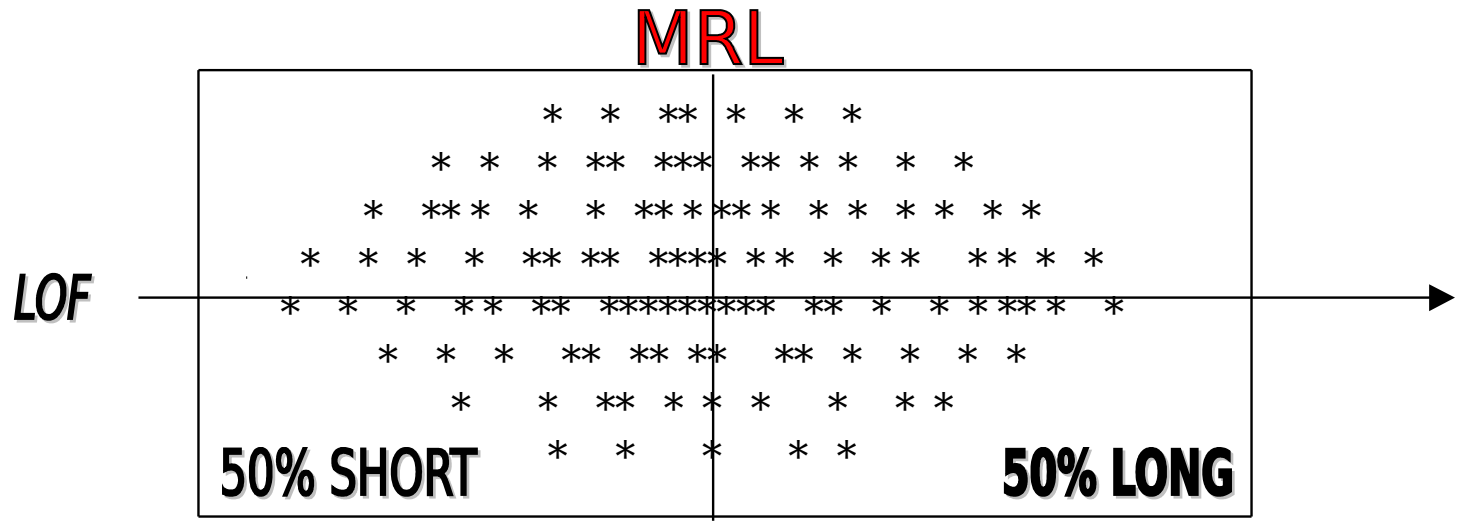


MEAN RANGE LINE

IS DRAWN PERPENDICULAR TO THE LINE OF FIRE, AT THE CENTER OF THE BURSTS.

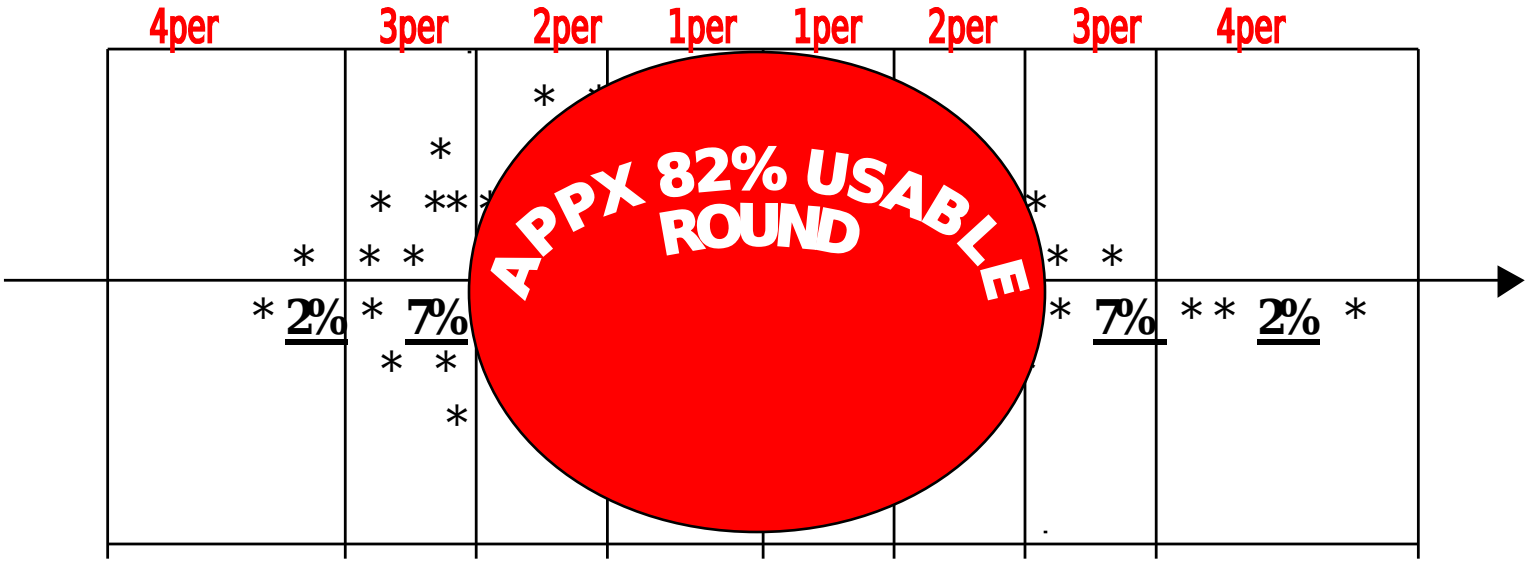
THIS LINE DIVIDES THE BURST INTO TWO GROUPS.

THE FIRST GROUP IS SHORT OF THE MBL, AND THE SECOND IS OVER IN CONSIDERATION TO THE WEAPON



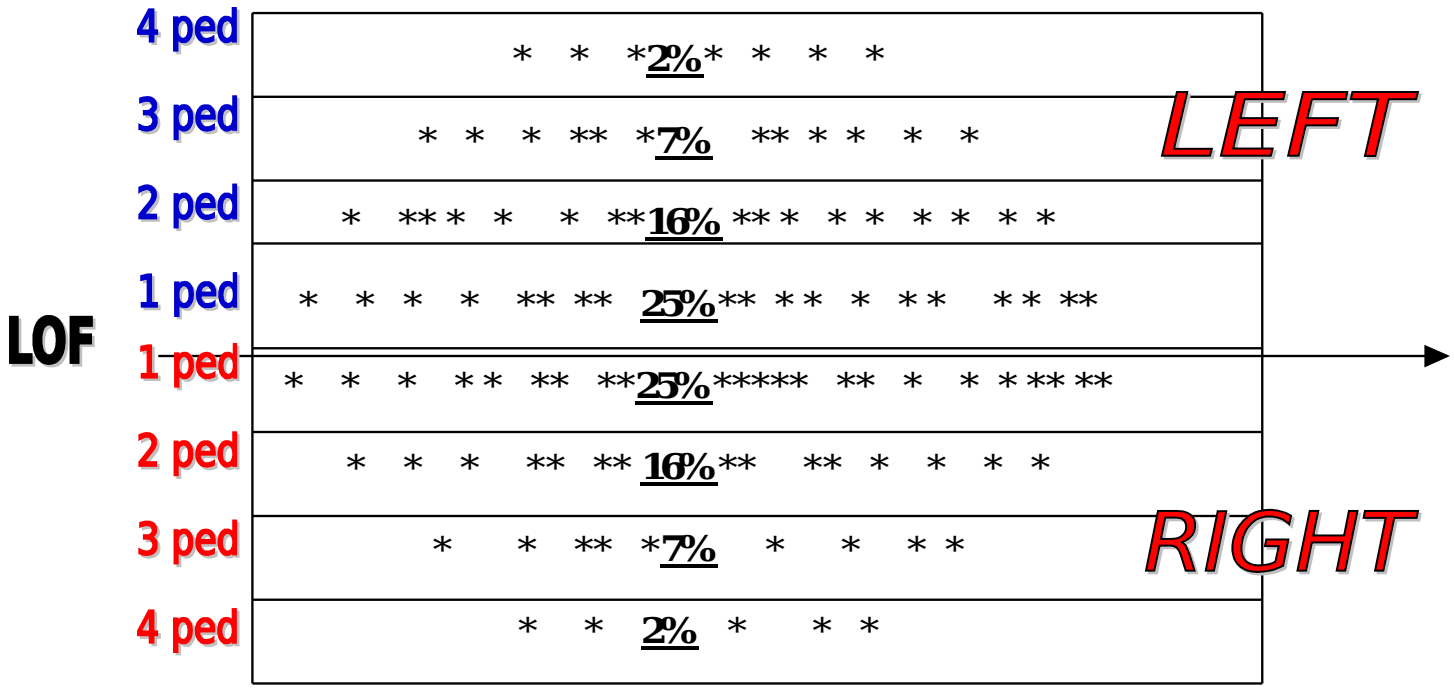
PROBABLE ERROR IN RANGE

WE DIVIDE EACH HALF INTO FOUR EQUAL SEGMENTS, EACH SEGMENT IS ONE PROBABLE ERROR IN RANGE(Per).
(TBL G COL 3)
Per IS NOTHING MORE THAN AN ERROR THAT IS EXCEEDED AS OFTEN AS IT IS NOT EXCEEDED.



PROBABLE ERROR IN DEFLECTION

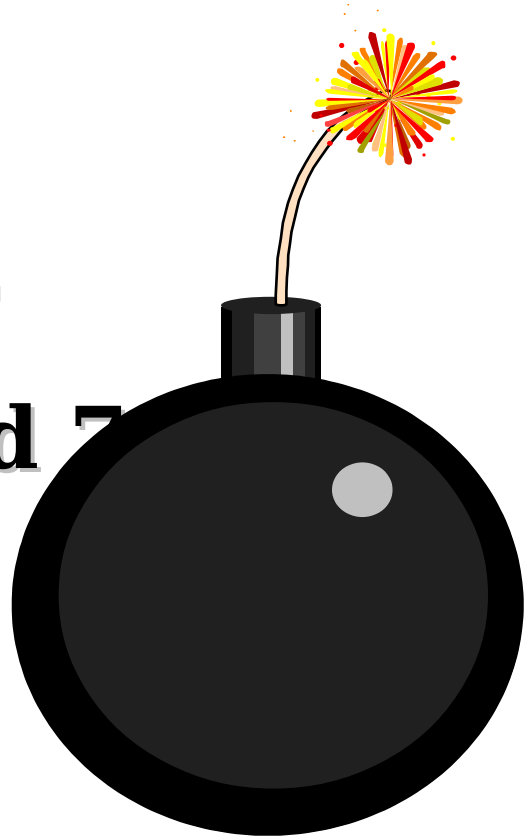
THE SAME METHOD CAN ALSO BE USED TO SHOW THE PROBABLE ERRORS IN DEFLECTION COL 4, TBL "G" TFT



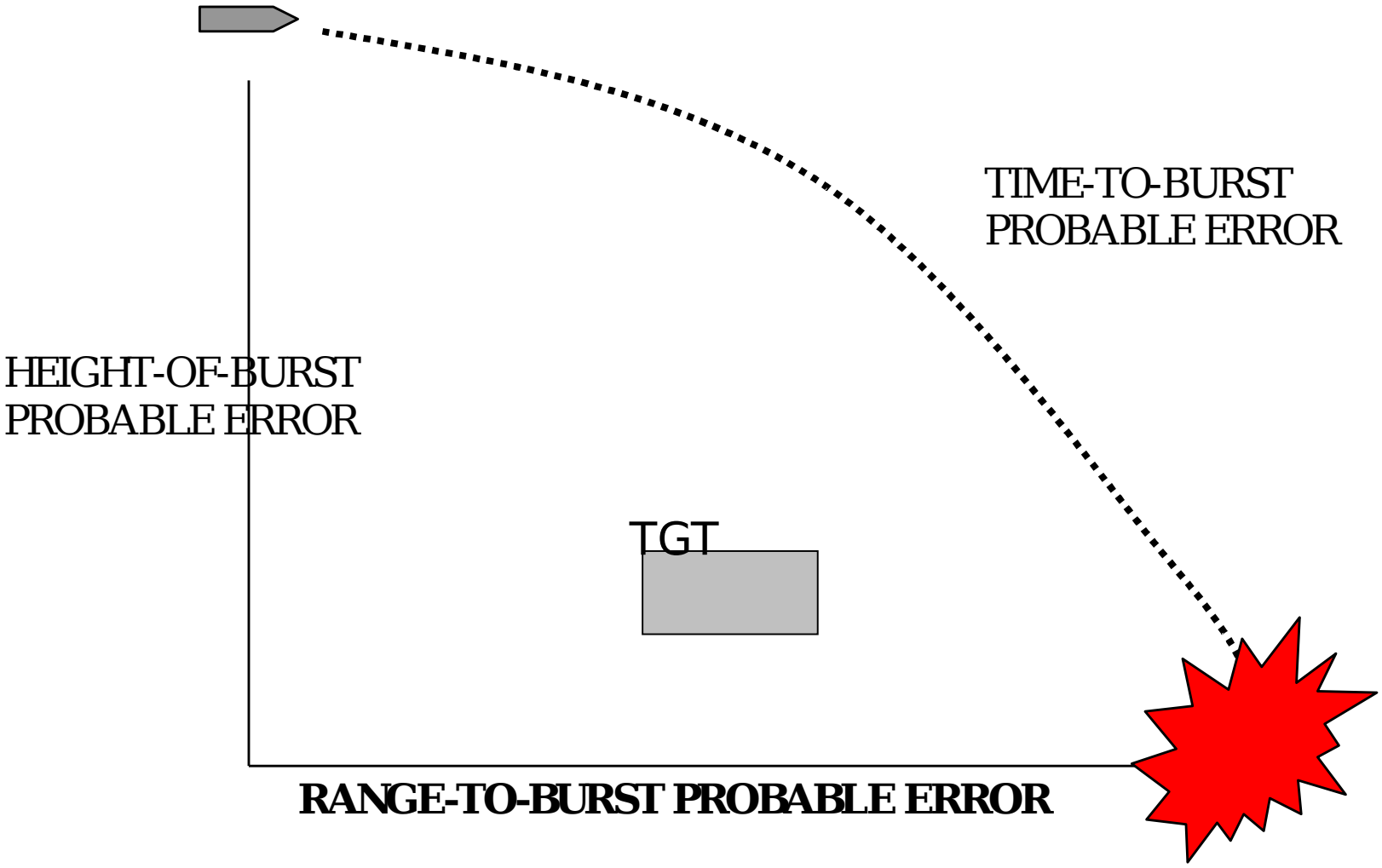
TIME FUZES ARE SUBJECT TO PROBABLE ERRORS AS WELL.

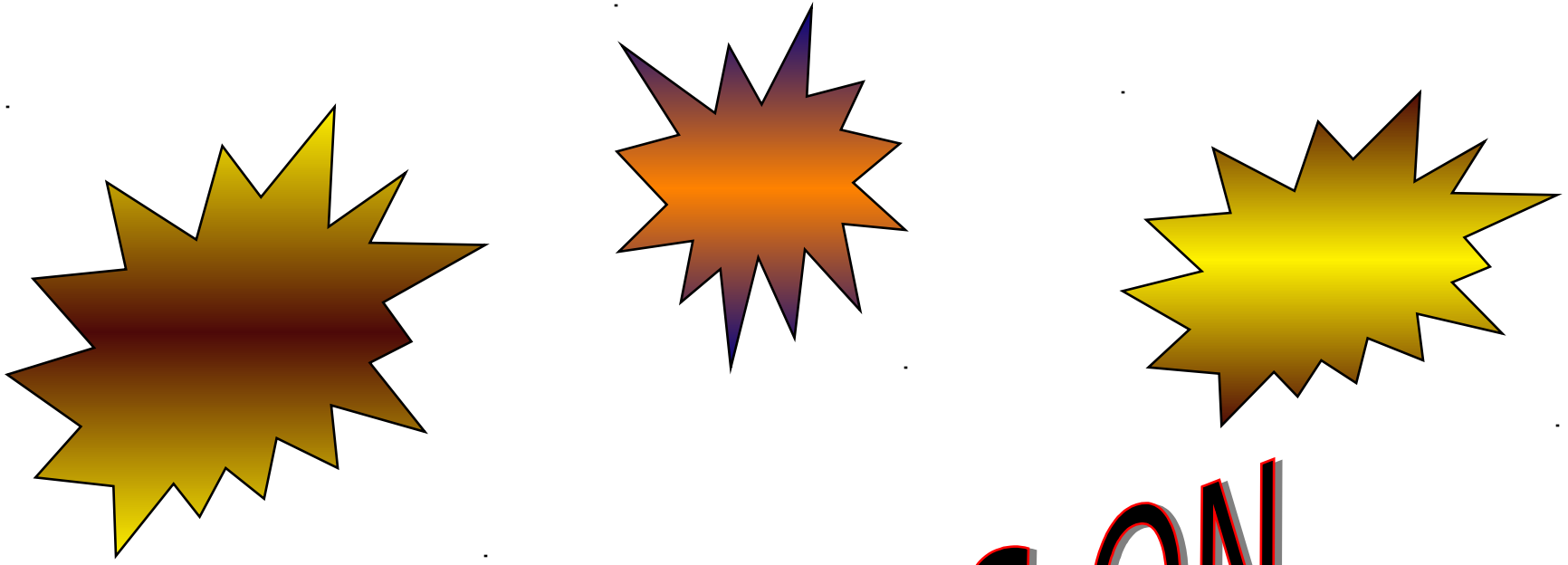
Table “G”/ TFT

columns: 5, 6, and 7



TIME FUZE PROBABLE ERROR

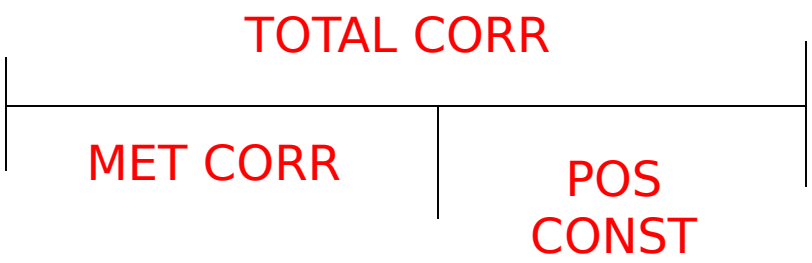




QUESTIONS ON Per, Ped, or TI FZ Pe

STEP 3: DETERMINE TOTAL CORRECTIONS

- **TOTAL CORRECTIONS =**
- **DID HIT DATA - SHOULD HIT DATA**
- **TOTAL CORRECTIONS EQUAL THE SUM OF MET CORRECTIONS AND POSITION CONSTANTS**



METT CORRECTIONS:

ARE ALL MEASURABLE NONSTANDARD CONDITIONS FOR WHICH YOU CAN ACCOUNT.

POSITION CONSTANTS:

ALL NONSTANDARD CONDITIONS THAT ARE DIFFICULT TO IDENTIFY, SMALL IN MAGNITUDE, AND REMAIN RELATIVELY CONSTANT.

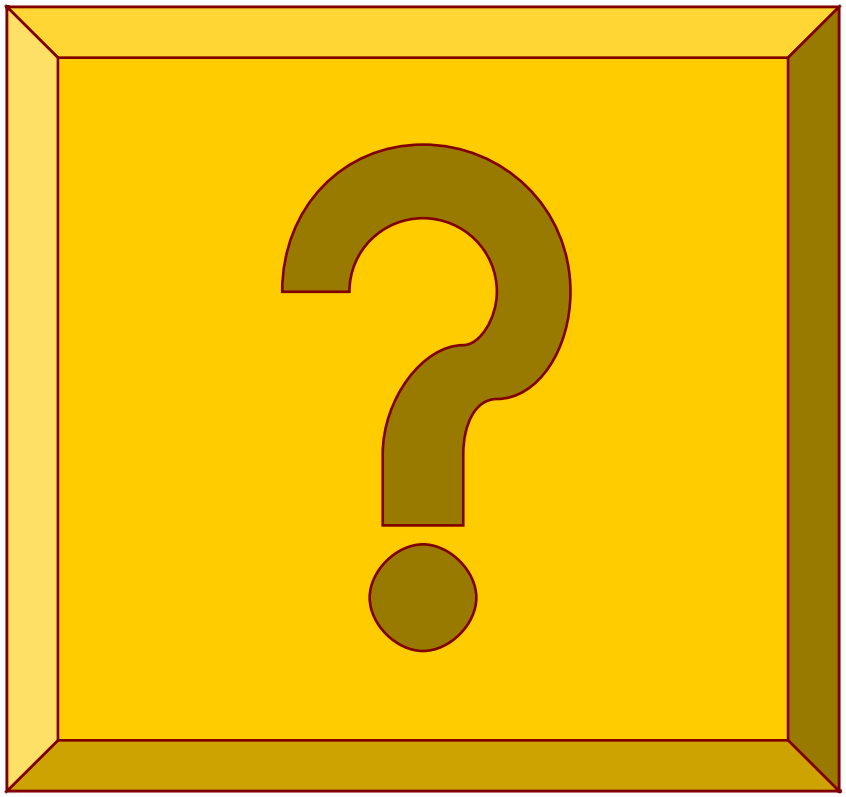
STEP 4: ISOLATE POSITION CONTANTS

- USE THE CONCURRENT MET TECHNIQUE
- TOTAL CORRECTIONS - MET CORRECTIONS = POSITION CONSTANTS

STEP 5: DETERMINE NEW TOTAL CORRECTIONS

- USE THE SUBSEQUENT MET TECHNIQUE

- NEW MET CORRECTION + POSITION CONSTANTS = NEW TOTAL CORRECTIONS



QUESTIONS

MET MESSAGES

Provides specific weather information at specific altitudes.

1. Ballistic Met Message: **Cannon,rocket, mortars and air defense.**
2. Computer Met Message: **Artillery computer systems.**
3. Fallout Met Messages: **Nuclear and Chemical fallout.**
4. Target Acquisition Met Messages: **Radar platoon.**

COMPUTER MET (PG 11-11)

- ***WEATHER ELEMENTS .***
- ***PRESSURE .***
- ***COMPUTER MET IS DIVIDED INTO TWO PARTS.(IDENTIFICATION LINE AND THE BODY).***

IDENTIFICATION LINE:

- **IS DIVIDED INTO FOUR GROUPS:**

GROUP 1: ***"CONTAINS IDENTIFICATION DATA"***

METCM

- ***OCTANT***

"GROUP 2"

- **DESIGNATES THE CENTER OF THE AREA IN WHICH THE MESSAGE IS VALID.**
- **LOCATION IS EXPRESSED IN TENS OF DEGREES AND TENTHS OF DEGREES OF LATITUDE AND LONGITUDE. (512/018)**
- **51 DEGREES, 2X6=12 MINUTES LATITUDE**
  101 DEGREES, 8X6=48 MINUTES LONGITUDE
- **IF LONGITUDE IS OVER 100 THE PRECEDING 1 IS DROPPED.**

"GROUP 3"

- **COVERS THE DATE, TIME AND DURATION OF THE MET MESSAGE.**
- **07 : IS THE GREENWICH DATE WHEN INFORMATION WAS DETERMINED.**
- **095 : IS THE GMT IN HOURS AND TENTHS OF HOURS. 09.5 5X6=30 0930**
- **0 : IS THE DURATION (U.S. FORCES DO NOT PREDICT)"WE MEASURE NOT PREDICT"**

GROUP 4

- ***INFORMATION ABOUT "MDP" (LOCATION OF MET STATION)***
- ***049: ALT OF MDP IN TENS OF METERS. 049=490 METERS***
- ***987: MDP PRESSURE IN MILLIBARS. (WHEN PRESSURE IS 1000 MILLIBARS OR HIGHER, PRECEDING 1 IS DROPPED)***

THE BODY

- ***CONSISTS OF TWO EIGHT NUMBER GROUPS.***

GROUP 1

- ***FIRST TWO DIGITS:*** *IDENTIFIES THE ALTITUDE ZONE : (00 IS THE LINE NUMBER)*
- ***NEXT THREE DIGITS:*** *INDICATES TRUE DIRECTION THE WIND IS BLOWING. (260 =2600, TRUE DIRECTION IN TENS OF MILS)*
- ***LAST THREE DIGITS*** *: WIND SPEED IN KNOTS. 018 = 18 KNOTS*

GROUP 2

- ***FIRST FOUR DIGITS:*** ***INDICATES ACTUAL AIR TEMP EXPRESSED IN DEGREES KELVIN (K) TO THE NEAREST TENTH OF A DEGREE.***
- ***LAST FOUR DIGITS :*** ***INDICATES ACTUAL AIR PRESSURE IN MILLIBARS(mb), TO THE NEAREST mb. (0987 AIR PRESSURE)***

COMPUTER MET VALIDATION PROCEDURES

- **1ST EXAMINE FOR POSSIBLE ERRORS:**
- **DATE AND TIME:** **"ENSURE MET IS CONCURRENT WITH REGISTRATION."**
- **EXAMINE WIND DIRECTIONS:** **"ANY DIRECTION CHANGES 1000 mils OR MORE LINE TO LINE IS SUSPECT."**

- **WIND SPEED:** ***"CHANGES OF 10 KNOTS OR GREATER FROM LINE TO LINE."***
- **TEMP:** ***"SEVERE INCREASE OR DECREASE OF 20 DEGREES KELVIN FROM LINE TO LINE."***
- **PRESSURE:** ***"MDP PRESSURE AND 00 LINE PRESSURE SHOULD BE THE SAME."***

VERIFY FOLLOWING COMPUTER MET MESSAGE

METCM1512018 070950049987

00260018 26980987

01260018 26890974

02270022 26740955

03300025 26600900

04310030 26510848

05330039 26350820

VERIFY FOLLOWING COMPUTER MET MESSAGE

METCM3312471 06075001966

00310004 30300966

01249013 30120953

02316012 29960928

03337013 29100886

04371014 28820883

05455015 27620880

QUESTIONS?